

HP StorageWorks Oracle Zero Downtime Backup Solution Using the XP Disk Array with XP External Storage and Data Protector on HP-UX

implementation guide

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About this guide

This guide is intended to address many of the integration issues that may be encountered when setting up an EBS environment and provide suggestions for the best solution. This guide does not provide specific documentation for installing and configuring data protection software or tape library hardware. References to the appropriate documentation are given when necessary. This guide addresses special configuration procedures that might not be covered in vendor documentation that can help in setting up an efficient EBS environment.

Intended audience

This guide is intended for network or database administrators who are implementing the HP StorageWorks Oracle ZDB Solution with XP External Storage and Data Protector on HP-UX.

Related documentation

For proper disk array setup and configuration, the following HP StorageWorks XP disk array documents are available at <http://www.hp.com/support/rwc/manuals>:

- *HP StorageWorks LUN Configuration and Security Manager for XP User Guide for the XP10000/XP12000*
- *HP StorageWorks Business Copy XP User Guide for the XP10000/12000*
- *HP StorageWorks Command View XP Advanced Edition for XP Disk Arrays User Guide*
- *HP StorageWorks RAID Manager XP User's Guide*
- *HP StorageWorks External Storage XP User Guide*

For proper installation and configuration of HP OpenView Storage Data Protector, the following documents are available at http://ovweb.external.hp.com/lpe/doc_serv:

- *HP OpenView Storage Data Protector Installation and Licensing Guide*
- *HP OpenView Storage Data Protector Zero Downtime Backup Integration Guide*
- *HP OpenView Storage Data Protector Integration Guide for Oracle and SAP*
- *HP OpenView Storage Data Protector Administrator's Guide*

For information about compatibility and implementation, the following documents are available on the EBS website: <http://www.hp.com/go/ebs>.

- *HP StorageWorks Enterprise Backup Solution Hardware/Software Compatibility Matrix*
- *HP StorageWorks Enterprise Backup Solution Design Guide*
- *HP StorageWorks EBS with HP OpenView Storage Data Protector V5.1 Implementation Guide*
- *HP StorageWorks Enterprise Backup Solution Example Configurations*

Document conventions and symbols

Table 1 Document conventions

Convention	Element
Blue text: Table 1	Cross-reference links and e-mail addresses
Blue, underlined text: http://www.hp.com	Web site addresses
Bold text	<ul style="list-style-type: none">• Keys that are pressed• Text typed into a GUI element, such as a box• GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes
<i>Italic</i> text	Text emphasis
Monospace text	<ul style="list-style-type: none">• File and directory names• System output• Code• Commands, their arguments, and argument values
<bracketed> text	<ul style="list-style-type: none">• Code variables• Command variables
Monospace, bold text	Emphasized monospace text

 **WARNING!**

Indicates that failure to follow directions could result in bodily harm or death.

 **CAUTION:**

Indicates that failure to follow directions could result in damage to equipment or data.

 **IMPORTANT:**

Provides clarifying information or specific instructions.

 **NOTE:**

Provides additional information.

 **TIP:**

Provides helpful hints and shortcuts.

HP technical support

Telephone numbers for worldwide technical support are listed on the HP support web site: <http://www.hp.com/support/>.

Collect the following information before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Error messages
- Operating system type and revision level
- Detailed questions

For continuous quality improvement, calls may be recorded or monitored.

Subscription service

HP strongly recommends that customers register online using the Subscriber's choice web site: <http://www.hp.com/go/e-updates>.

Subscribing to this service provides e-mail updates on the latest product enhancements, newest driver versions, and firmware documentation updates as well as instant access to numerous other product resources.

After subscribing, locate your products by selecting **Business support** and then **Storage** under Product Category.

Other HP web sites

For additional information, see the following HP web sites:

- <http://www.hp.com>
- <http://www.hp.com/go/storage>
- http://www.hp.com/service_locator
- <http://www.docs.hp.com>

1 Introduction

The HP StorageWorks Oracle zero downtime backup (ZDB) solution provides the means to back up an Oracle database with minimal database and database server impact. ZDB uses the following:

- HP StorageWorks XP12000 Disk Array
- External Storage XP
- Business Copy XP
- HP OpenView Data Protector and HP StorageWorks Raid Manager XP software
- HP StorageWorks tape libraries

This combination enables mirroring the database data volumes with Business Copy (BC) volumes, synchronize the BC volumes with the database primary volumes, and then split the mirror. The BC volumes can then be presented to a backup server for copying the data to tape. After the backup, BC volumes are rejoined with the primary volumes and resynchronized. The backup server offloads precious processing resources from the database server, and the Oracle database remains available during the entire process. This solution takes advantage of XP external storage that offers lower cost storage for mirrored data backup purposes. ZDB solutions are one of many different data protection solutions offered by HP. ZDB solutions are unique in that they tie many software and hardware products together. Choosing a solution based on HP technology provides supportability and known compatibilities.

HP support of Oracle ZDB solution components

HP offers numerous products in support of the Oracle ZDB solution:

- HP 9000 servers
- Various SAN interconnects:
 - Fibre Channel switches
 - Host bus adapters
 - Disk array controllers
 - Tape controllers
- The HP StorageWorks XP 12000 disk array serves as the hardware BC volume provider.
- HP StorageWorks Raid Manager and Raid Manager Library software serve as the split mirror initiator in the ZDB-based solutions.
- HP StorageWorks ESL9000 or E-Series tape library
- HP OpenView Data Protector serves as the application used to control the database backup and recovery process.

Enterprise Backup Solutions overview

ZDB solutions require storage components such as tape libraries, disk arrays, and servers, all on a common Fibre Channel storage area network (SAN). HP StorageWorks Enterprise Backup Solution (EBS) is the HP traditional SAN backup solution in which the servers are in the data path from the source to the target. Setting up a Fibre Channel (FC) SAN backup solution can be challenging. Components are typically purchased at different times and arrive separately, or they are purchased from different vendors. Each piece of hardware ships with documentation for setup and deployment. These challenges may require additional time and money. HP is committed to keeping these challenges to a minimum by providing the *HP StorageWorks Enterprise Backup Solution Design Guide* and this document. These and other EBS docs are available at <http://www.hp.com/go/ebs>.

EBS history

HP engineering teams have developed a comprehensive approach to ensuring that hardware, firmware, and software components are properly fitted into an Enterprise Backup Solution. HP engineers test the supported configurations and develop best practices to follow when setting up an EBS environment. The teams also test backup solution software and provide best practices to ensure that the EBS environment runs smoothly.

HP StorageWorks Command View XP Advanced Edition overview

HP StorageWorks Command View XP Advanced Edition (AE) provides a web-based interface to the XP configuration and monitoring functions. The web-based interface is served by a Windows server and is accessible over the LAN with a web browser. The Device Launcher tab of the Command View XP AE graphical user interface (GUI) contains a list of arrays that can be managed.

Selecting the XP 12000 opens the Identity window, which is used for managing the XP 12000, as shown in [Figure 1](#).

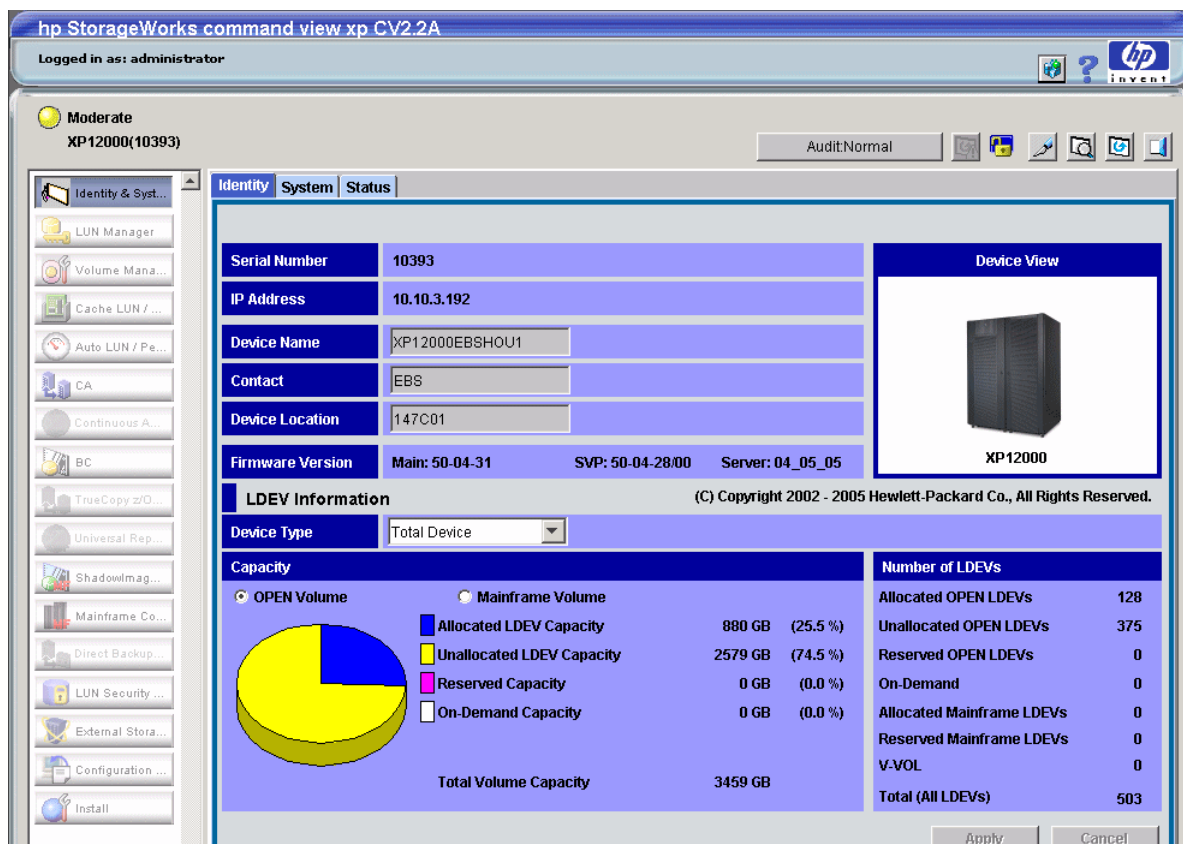


Figure 1 Command View XP AE Identity window

In the left navigation pane, tabs may be selected for managing the XP 12000. For the ZDB solution, the LUN Manager, Volume Manager, BC, and External storage tabs are used as follows to configure the XP 12000:

- **LUN Manager**—Used to present XP logical devices (LDEV) to hosts.
- **Volume Manager**—Used to group multiple physical devices to create a single LDEV.
- **BC**—Used to create BC volumes that mirror primary LDEVs.
- **External Storage**—Used to manage the MSA1500 as XP external storage. In this solution, the XP external storage is used as the BC volumes.

Raid Manager and Raid Manager Library overview

Raid Manager and Raid Manager Library are used by application and backup servers in the ZDB solution to:

- Identify XP LDEVs that have been presented to servers.
- Define primary LDEV and BC pairs.
- Initiate XP BC volume synchronization with XP primary data volumes.
- Split mirrors and mount on the backup server for data backup.
- Join and re-synchronize mirrors after backups complete.

Raid Manager Library is integrated with Data Protector for seamless communication with the XP disk array. This allows Data Protector to control the mirror synchronization, split, join, and re-synchronization process. When coupled with the Data Protector Oracle agent, the entire ZDB of the Oracle database is automated and controlled by Data Protector.

ZDB topology

Figure 2 shows the physical and logical connectivity of the test environment. An MSA1500 storage array is used as external storage on the XP12000 array, allowing a Business Copy to be taken of the Oracle database and stored externally for backup using the backup server.

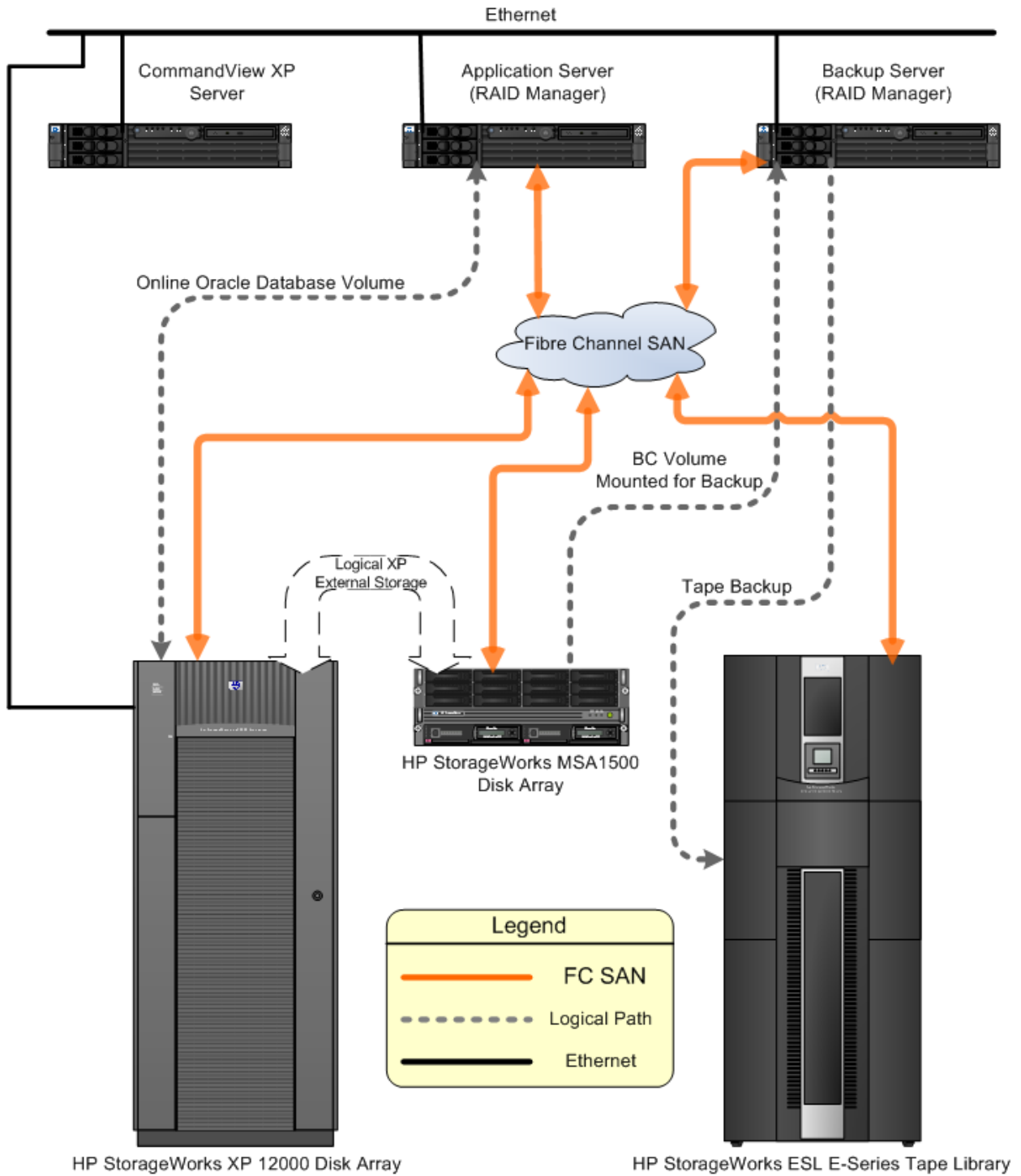


Figure 2 ZDB topology

Planning an Oracle ZDB solution

When designing a ZDB solution, several factors should be considered. These factors include database server impact, cost, backup and restore performance, array integration, and ease of configuration and use. Because of the complexity of these solutions, they may be easy to use but can be difficult to set up.

Design consideration factors

Although cost is a major factor, many administrators are even more concerned with the impact of the ZDB solution on the database server and the availability of the database. Using an off-host server removes the heavy demands of backups from the database server; however, database availability is the most noted benefit of ZDB solutions. Good performance can be achieved by using a capable backup server or multiple backup servers.

Restores are also a very important part of the solution, but they are often overshadowed by the benefits of the backups. Restores are accomplished by retrieving data from tape directly to the database server.

Finally, array integration has a big impact on how the ZDB solution behaves. ZDB solutions require a hardware mirror or snapshot of the primary data volume. Consider whether to use XP internal storage or XP external storage for the BC volumes. Cost, performance, and implementation are contributing factors in this decision. In a test environment, XP internal storage performed 20-30% faster than XP external storage. This implementation guide focuses on XP external storage that uses the HP StorageWorks MSA1500 for BC volumes. Using an MSA1500 as XP external storage may result in a performance decrease; however, the MSA1500 offers a low-cost alternative for BC volumes that are used by an offhost to backup application data. In a ZDB offhost backup scenario, the time required to complete a backup is not as critical as a scenario in which the application server performs the backup.

Database server prerequisites for the Oracle ZDB solution

- The Oracle database must be running in *archive*log mode.
- For file system backups:
 - The Oracle volumes must reside on VxFS file systems.
 - If Online JFS is installed on the database server, the Oracle volume VxFS file systems should be mounted using the VERITAS direct I/O options:
 - `mincache=direct`
 - `convosync=direct`
 - The Oracle volume VxFS file systems must use control intent logging, which is enabled by mounting the file system with the `log` or `delaylog` option.

NOTE:

To eliminate the need to unmount the file-system prior to backup, and to guarantee file system and data integrity, HP recommends using Online JFS and direct I/O with the `log` option. There are cases where the alternative direct I/O option `delaylog` will not work, such as a crash during file/directory creation or deletion.

Other requirements

The following five steps must be completed before an Oracle ZDB can be performed:

1. Place the database in *hot backup* mode (online backup), or shut down the database (offline backup).
2. Synchronize, split, and mount the BC volumes on the backup server.
3. Take the database out of backup mode (online backup), or start the database up (offline backup).
4. Backup the database.

5. Unmount the BC volumes from the backup server and resynchronize with the primary data volumes.

When planning the ZDB solution, make sure that the components of the solution can accomplish these five steps. Integration with Data Protector greatly simplifies the implementation of these steps.

 **NOTE:**

Archive log, parameter file, and password file backups are performed by separate Data Protector backup specification(s) and are not discussed in this document. For full database disaster recovery the archive logs, parameter file, and password file should be backed up on a regular basis.

SAN configuration requirements

Use the following Fibre Channel configuration guidelines to ensure that the mirrored data in an XP external storage ZDB solution can be copied to the tape library by the backup server, and can be retrieved from the tape library by the database server:

- When configuring the SAN, the XP disk array and tape library interface controllers must be presented to both the database server and the backup server.
- The data to be backed up must be located on an XP disk array or on a supported XP external storage disk array.
- The XP external storage disk array must be part of the SAN environment or must have a direct Fibre Channel point-to-point connection with the XP disk array.
- If the XP external storage is part of the SAN environment and zoning is being used, then the XP disk array and the XP external storage disk array must be in the same zone.

2 Implementing an Oracle ZDB Solution with XP External Storage

Configuration rules and recommendations are based on the solution integration testing conducted by HP. Certain limitations apply and are noted where applicable. This implementation guide can be leveraged as a template for similar solutions where there may be minor changes in design, such as the operating system version or HBAs used.

Solution components

- HP StorageWorks Raid Manager (1.17.04)
- HP StorageWorks Raid Manager Library (1.11.03)
- HP StorageWorks XP 12000 disk array (50-04-01)
- HP StorageWorks MSA1500 disk array (4.84.B276)
- HP PA-RISC database application and backup servers
- HP-UX 11iv2 for PA-RISC (11.23)
- Logical Volume Manager (LVM)
- Online JFS or JFS
- VxFS filesystems
- Oracle Database 10g
- HP OpenView Data Protector 5.5
 - Disk Agent
 - Media Agent
 - HP StorageWorks XP Agent
 - Oracle Integration
- HP StorageWorks ESL9000 or E-Series tape library with the HP StorageWorks e2400-160 Fibre Channel Interface Controller and the HP StorageWorks Interface Manager card
- A6826A - 2G PCI-to-Fibre Channel Host Bus Adapters for HP-UX

Solution execution steps

This solution executes the following steps, which are initiated by the Data Protector Oracle database backup specification:

1. Obtain a list of database data files and tablespaces.
2. Obtain a list of the XP disk array source volumes on which the database data files reside.
3. Place the database in hot backup mode (online backup) or shut down the database (offline backup).
4. Synchronize the XP disk array P-Vols and S-Vols on which the database data files reside.
5. Split the XP disk array S-Vols from the P-Vols and mount the S-Vols on the backup server.
6. Take the database out of hot backup mode (online backup) or startup the database (offline backup).
7. Use the RMAN utility to perform a backup to tape of the database and the control files in backup set mode from the XP disk array S-Vols mounted on the backup server.
8. Backup the recovery catalog database.

9. Unmount the XP disk array S-Vols from the backup server and join them with the P-Vols to be resynchronized.

The remainder of this chapter is a guide for installing and configuring the solution components so that the above steps can execute.

Configuring an MSA1500 as an XP12000 external disk array

Connecting the MSA1500

The HP StorageWorks 1500 Modular Smart Array (MSA1500 or MSA) can be connected to the XP12000 as an external disk array by either connecting the MSA controller Fibre Channel (FC) port directly to an XP FC port, or by connecting the MSA controller FC port and the XP FC port to a SAN switch.

NOTE:

If the ports are connected to a SAN switch and SAN zoning has been implemented, the MSA FC port and XP FC port must exist in the same active SAN zone.

NOTE:

In this solution, the MSA1500 uses an active/passive controller configuration. HP recommends that the standby MSA controller be connected to an XP port on a different XP cluster. If the MSA is connected with two controllers (recommended to improve High Availability), set the MSA port's host mode to *Tru64* and use Selective Storage Presentation to present the LUNs to the XP array. If a single MSA controller is connected, using Selective Storage Presentation is optional and the host mode may be set to Windows. Setting the MSA's mode does not affect the XP's presentation to the hosts that are connected to it. For the purposes of this document, it is assumed that two MSA controllers are in use.

See the following documents at <http://www.hp.com/go/storage> for information about configuring the MSA:

- *HP StorageWorks 1500 Modular Smart Array QuickSpecs*
- *HP StorageWorks Modular Smart Array 1500 cs Installation Guide*

Setting up the MSA

To set up the MSA for use as an external disk array connected to the XP12000, perform the following steps:

1. Define an MSA array object. See [Defining MSA array objects](#).
2. Calculate the MSA logical drive size and define an MSA logical disk (also known as a LU). See [Calculating the MSA logical drive size and defining a logical drive](#).
3. Use Selective Storage Presentation to institute LUN security. See [Using Selective Storage Presentation](#).

Use the HP Array Configuration Utility (ACU) to configure the MSA for its role as an XP external array. ACU runs from a server attached to the MSA via a Fibre Channel path.

NOTE:

The ACU and ACU Online User Guide can be found at: <http://h18004.www1.hp.com/products/servers/proliantstorage/software-management/acumatrix/index.html>.

Defining MSA arrays

Use the Array Configuration Utility (ACU) to create an MSA array.

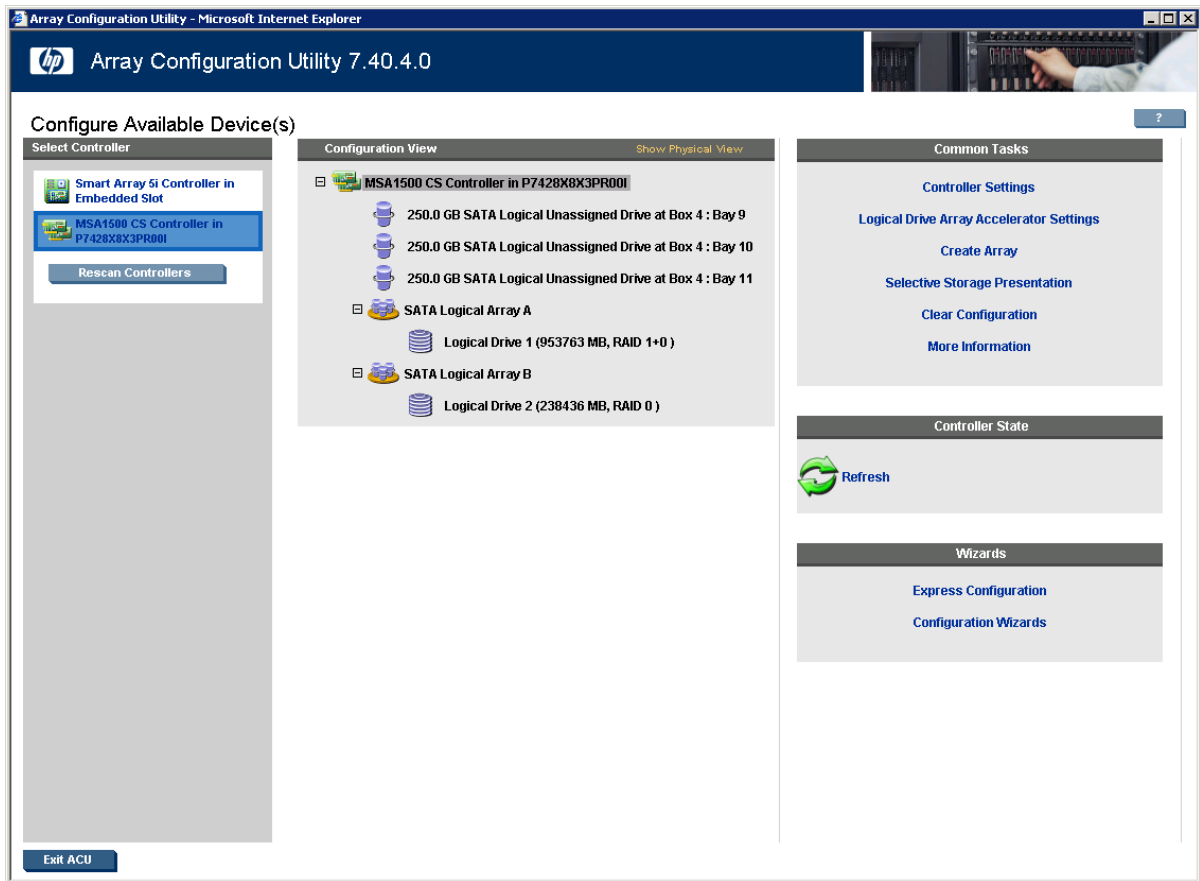


Figure 3 Array Configuration Utility

After defining an array, define a logical drive (LU) within that array object.

Calculating the MSA logical drive size and defining a logical drive

The ACU used for configuring the MSA uses an optimization algorithm to calculate the user size of a new LU, given a user-specified size in MB. The optimization algorithm cannot be bypassed or disabled and must be compensated for so that MSA LUs are created at the correct size.

When creating a new LU through the ACU, specify the LU size as two to three MB larger than needed for presentation to the XP12000. For example, suppose a 40 GB (40,960 MB) LU is being created on the MSA for use as XP external storage. If the exact size needed is requested, the ACU optimizes the LU to a size of 40,959 MB, which is one MB smaller than needed. In this case, the optimization algorithm the ACU uses can be compensated for by specifying a size of 40,963 MB, which results in the correct size of 40,960 MB (40 GB).

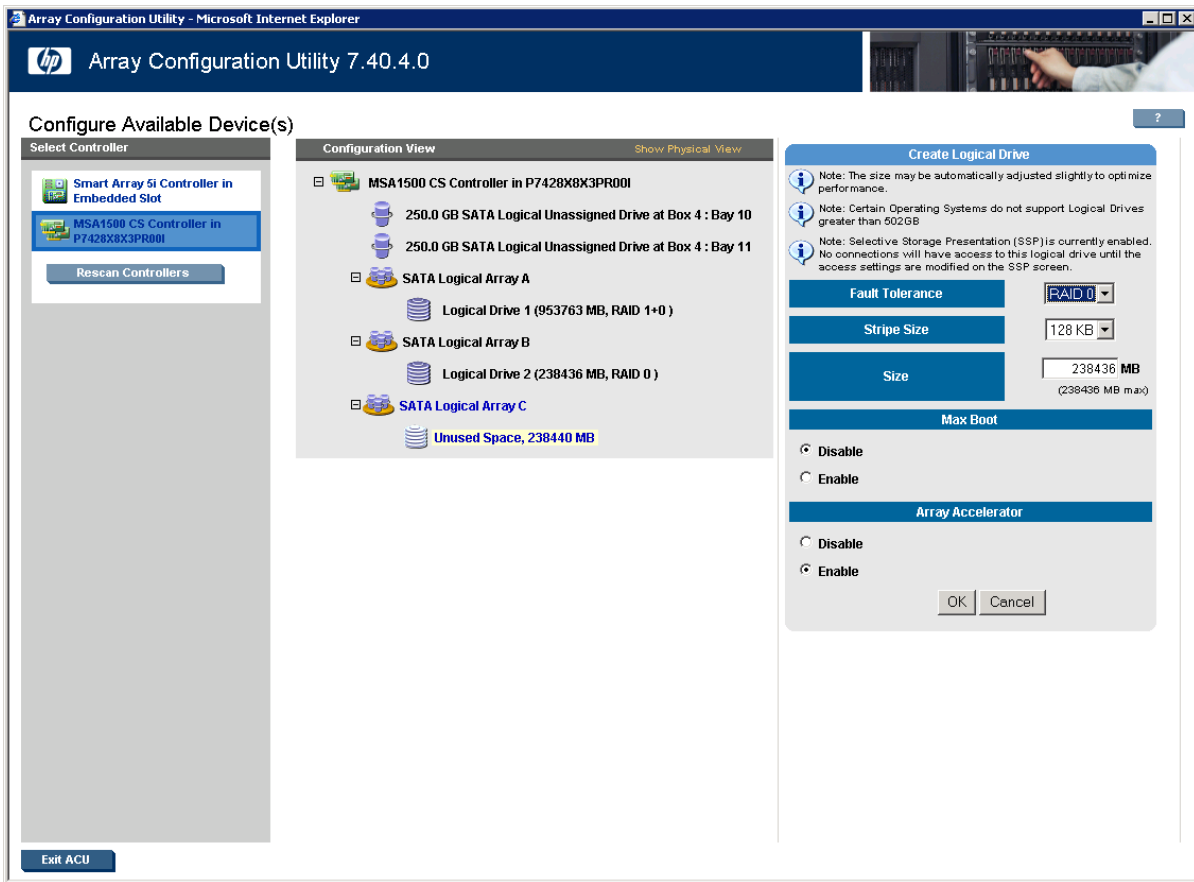


Figure 4 Array Configuration Utility – LU window

Using Selective Storage Presentation

Use the ACU Selective Storage Presentation (SSP) feature to limit access to the MSA logical drive to the XP12000 world wide name(s). Set the operating system mode corresponding to the XP FC port WWN to TRU64.

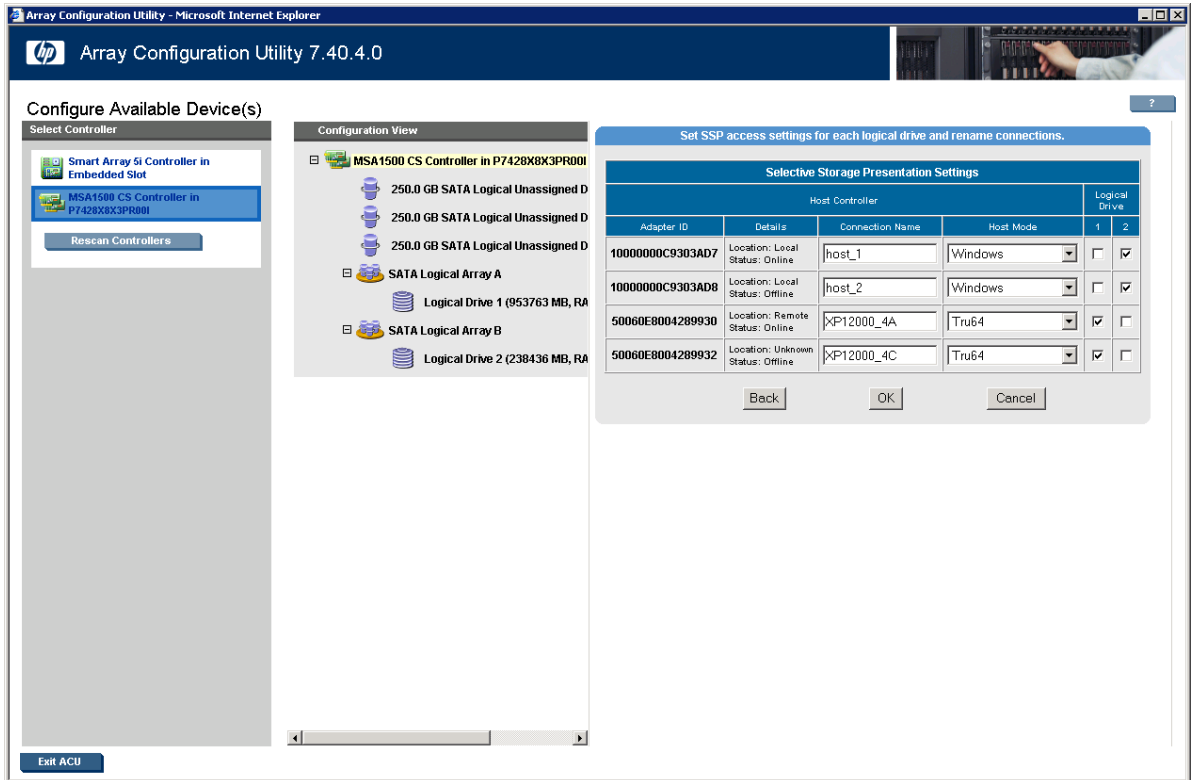


Figure 5 Array Configuration Utility – SSP window

Setting up the XP external storage BC volumes

This section describes how to setup XP external storage BC volumes by:

1. Creating XP external storage logical devices (LDEVs). See [Creating XP external storage LDEVs](#).
2. Presenting the XP external storage LDEVs to the backup server. See [Presenting the XP external storage LDEVs to the backup server](#).
3. Mirroring the database data volumes by creating BC volumes on XP external storage LDEVs. See [Mirroring the database data volumes by creating BC volumes on XP external storage LDEVs](#).

NOTE:

This document assumes the Oracle database has already been created on the application server and that the database data files reside on XP internal storage LDEV volumes. This document also assumes that an MSA1500 has been setup as XP external storage. For details on setting up the XP disk array refer to the XP disk array documentation referenced earlier in this document.

Creating XP external storage LDEVs

To create XP external storage LDEVs:

1. Start the Command View XP AE web-based GUI on the Command View XP AE server.
2. Launch the manager for the XP12000 disk array and click **Volume Manager**. The Volume Management window is displayed.

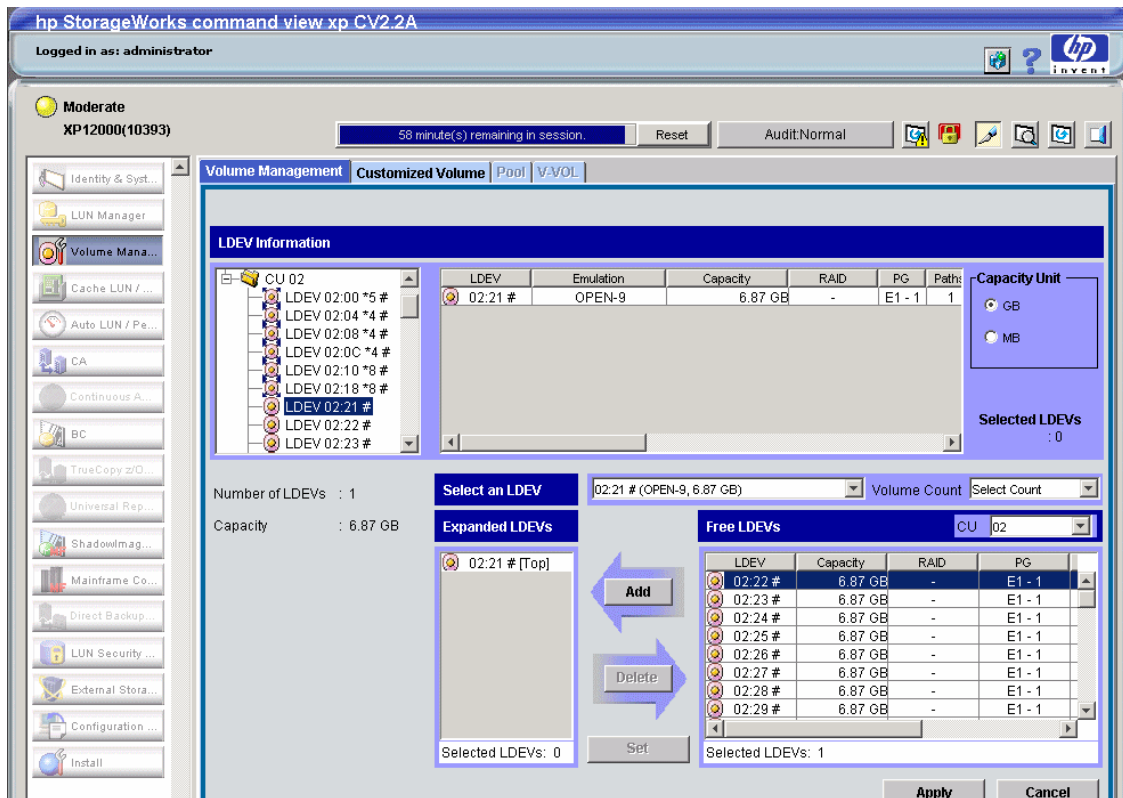


Figure 6 Command View XP AE Volume Management window

- Determine the control unit (CU) that controls the XP external storage. In [Figure 6](#), the control unit is *CU 02*.

NOTE:

The pound (#) sign after each LDEV indicates an external storage LDEV.

- Create external storage LDEVs that match the size of the database data volume LDEVs.

The size of the P-Vol and S-Vol in a mirrored pair must be identical. In this example, the default LDEVs created on the XP external storage are *OPEN-9*, with a size of 6.87GB. In [Figure 6](#), notice that six larger LDEVs on CU 02 have been created by expanding the existing LDEVs. For instance, an *OPEN-9*5* LDEV has been created by combining five *OPEN-9* LDEVs into a single LDEV.

To create expanded LDEVs:

- Select an LDEV to expand.
- Add additional LDEVs to the selected LDEV.
- After the desired additions have been made, click **Set**.
- Continue this process until all required expanded LDEVs have been set.
- Click **Apply** to create the expanded LDEVs.

NOTE:

The use of XP LUSE to aggregate external LUNs into a larger XP LDEV (or the use of CVS to divide a large external LUN into several smaller XPLDEVs) is not recommended for performance reasons. HP recommends importing external LUNs at their native size, in *OPEN-V* format.

Presenting the XP external storage LDEVs to the backup server

After the expanded XP external storage LDEVs have been created, they can be presented to the backup server. Click **LUN Manager** to access the LUN Manager window. Present the XP external storage expanded LDEVs to the backup server following the same process used for presenting any XP disk array LDEV to a server.

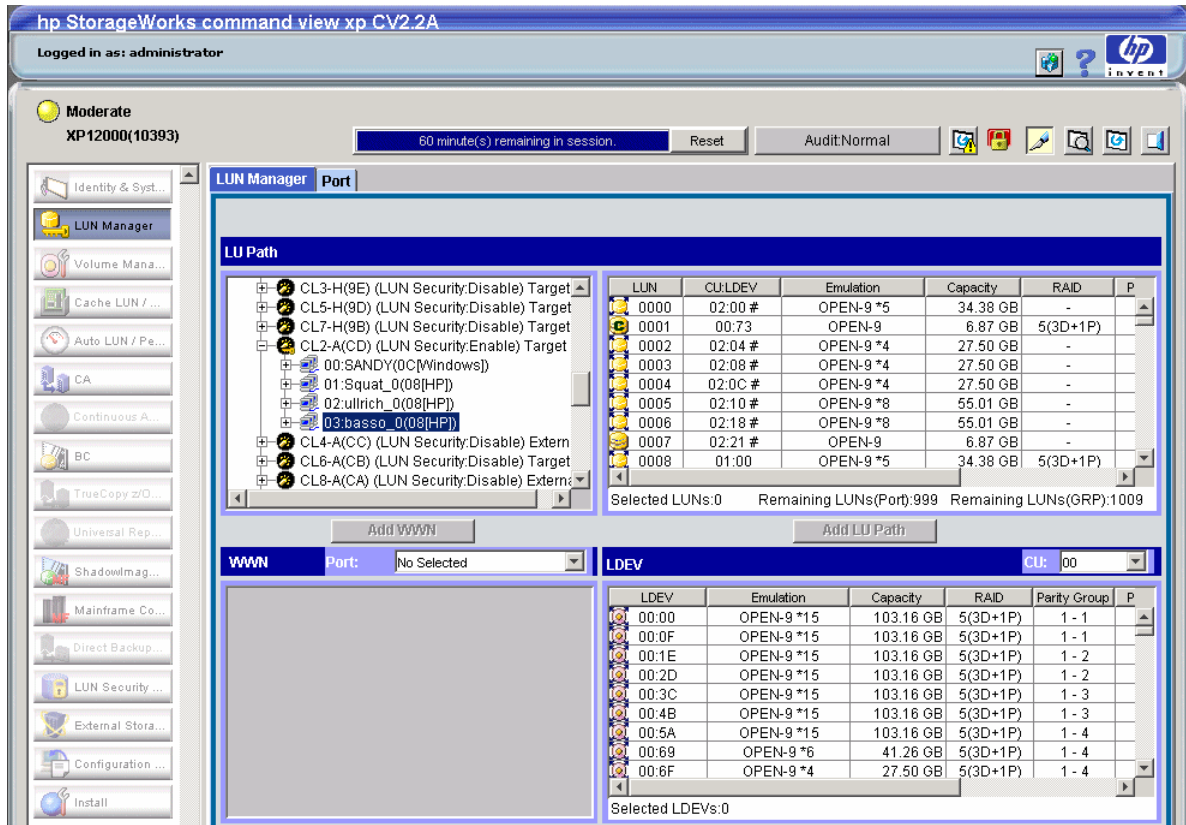


Figure 7 Command View XP AE LUN Manager window

Mirroring the database data volumes by creating BC volumes on XP external storage LDEVs

After the external storage LDEVs have been presented to the backup server, the BC volumes can be created on XP external storage LDEVs. Click **BC** to access the Business Copy window.

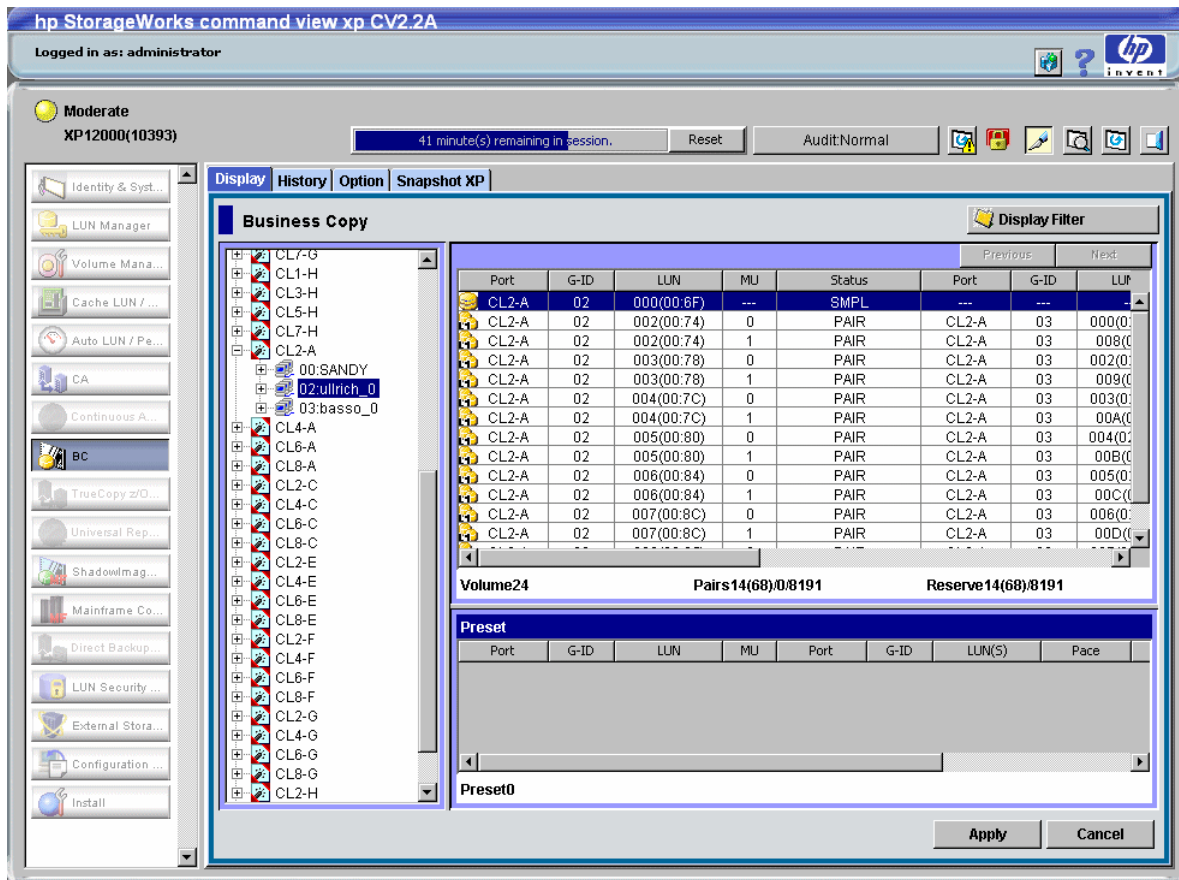


Figure 8 Command View XP AE Business Copy window

To create the BC volumes:

1. In the Business Copy window, navigate to the port of the LDEVs for the database data volumes and click the database server. In this example, the port is *CL2-A* and the database server is *ullrich*.
2. Highlight the LDEV to be mirrored, right click on the LDEV, and then select **Paircreate**.

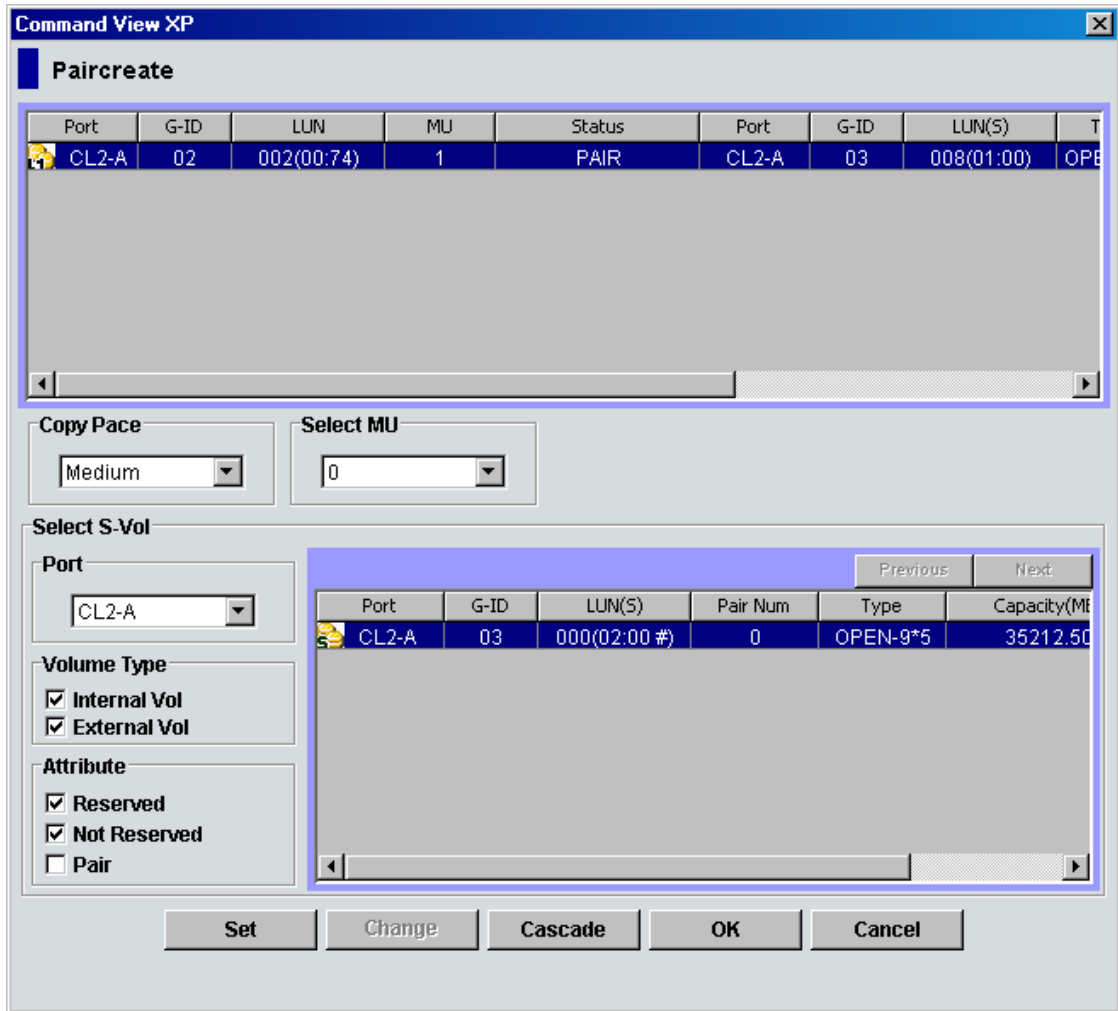


Figure 9 Command View XP AE Paircreate window

3. In the Paircreate window, select the port on which the XP external storage LDEVs reside, highlight the LDEV in the *Select S-Vol* box that will become the BC volume, and then click **Set** to close the Paircreate window.
4. In the Business Copy window, click **Apply** to create the P-Vol/S-Vol pair.
5. Repeat these steps for each BC volume to be created.

Installing RAID Manager Library on the backup and database servers

1. Log in as root.
2. Create a library installation directory, such as `/opt/raidmgrlib`.
3. Mount the RAID Manager Library distribution CD-ROM on `/cdrom`.



NOTE:

If the `/cdrom` directory does not exist, create one.

4. Change directories to `/cdrom` and run the `RLinstsh` script.
5. When prompted to specify the installation directory, enter the directory created in step 2.

Installing RAID Manager on the backup and database servers

1. Log in as root.
2. Create a RAID Manager installation directory, such as `/opt/raidmgr`.
3. Mount the RAID Manager distribution CD-ROM on `/cdrom`.



NOTE:

If the `/cdrom` directory does not exist, create one.

4. Change directories to `/cdrom` and run the `RMinstsh` script.
5. When prompted to specify the installation directory, enter the directory created in step 2.
6. Configure the RAID Manager service by adding the following line to `/etc/services`:
`horcm0 11000/udp # RMINST 0`
7. Modify the `/etc/horcm0.conf` configuration file. This file may need to be copied from the sample `horcm.conf` file found in the installation `/etc` directory.

HORCM_MON section:

- `ip_address` is the IP address or host name of the application server.
- `service` is the HORCM service that was added to `/etc/services` on the application server.
- `poll` is the monitoring interval for paired volumes.
- `timeout` is the remote server communication timeout.

HORCM_CMD section:

- `dev_name` is the path to the disk array command device. Multiple paths may be listed if necessary.

HORCM_DEV section:

- `dev_group` is a unique, arbitrary group name for a group of disk array volumes to be acted upon with a single RAID Manager command
- `dev_name` is a unique, arbitrary device name for an disk array volume, such as an Oracle data volume
- `port#`, `TargetID`, and `LU#` are values for addressing an disk array volume (see Determining LDEV Port, Target IDs and LUNs for the HORCM configuration file for determining these values)
- `MU#` is only used in the case of multiple S-Vols for a single P-Vol and will not be used in this example.

HORCM_INST section:

- `dev_group` is the same group name used in the HORCMDEV section.
- `ip_address` is the IP address, or host name, of the backup server.
- `service` is the HORCM service that was added to `/etc/services` on the backup server.

The following is a sample `horcm0.conf` file for the application server:

```
HORCM_MON
#ip_address  service      poll(10ms)  timeout(10ms)
backupserver horcm0      1000        3000

HORCM_CMD
#dev_name    dev_name      dev_name
/dev/rdisk/c15t0d1  /dev/rdisk/c16t0d1
```

```

HORCM_DEV
#dev_group  dev_name  port#    TargetID  LU#  MU#
VG01        datavol1  CL1-A    3          3    0
VG01        datavol2  CL1-A    3          4    0
VG01        datavol3  CL1-A    4          0    0
VG01        datavol4  CL1-A    4          1    0
VG01        datavol5  CL1-A    0          1    0

HORCM_INST
#dev_group  ip_address  service
VG01        appserver  horcm0

```

Determining LDEV Port, Target IDs and LUNs for the HORCM configuration file

NOTE:

The port value should be the port used when configuring the LDEVs on the XP disk array (CL2-A, for example).

- For the TargetID and LUN value of the XP disk array volumes, run `ioscan -fnkC disk` on the server.
 - Volumes presented from the XP disk array start with the string `OPEN` in the description field. For example, `OPEN-9-CM` is the command device. LDEVs are other `OPEN-???` devices.
 - The device file contains the TargetID and LUN. For example, the device file `/dev/dsk/c15t1d2` has a TargetID of 1, and the LUN is 2.
- After creating the initial HORCM configuration file, run `horcmstart.sh` from the installation `/RAID_Manager_install_dir/usr/bin` directory to start the HORC manager.

NOTE:

Starting the manager is prohibited until the configuration file has been created.

- After starting the HORC manager, use the `raidscan` utility to show the devices presented from the XP disk array.

NOTE:

Using `raidscan` without starting the HORC manager is prohibited.

For example, `ls /dev/rdisk/* | raidscan -find` produces output similar to the following:

DEVICE_FILE	UID	S/F	PORT	TARG	LUN	SERIAL	LDEV	PRODUCT_ID
/dev/rdisk/c5t0d1	0	F	CL2-A	0	4	10393	115	OPEN-9-CM
/dev/rdisk/c5t0d2	0	F	CL2-A	1	3	10393	516	OPEN-9*4
/dev/rdisk/c5t0d3	0	F	CL2-A	1	4	10393	520	OPEN-9*4
/dev/rdisk/c5t0d4	0	F	CL2-A	1	5	10393	524	OPEN-9*4
/dev/rdisk/c5t0d5	0	F	CL2-A	1	6	10393	528	OPEN-9*8
/dev/rdisk/c5t0d6	0	F	CL2-A	1	7	10393	536	OPEN-9*8
/dev/rdisk/c5t0d7	0	F	CL2-A	2	1	10393	545	OPEN-9

- The `raidscan` utility shows the port (PORT), TargetID (TARG), and LUN of each LDEV. If these do not match what is entered in the HORCM configuration file, then modify the file to reflect the output of `raidscan`. Always use the port, TargetID and LUN shown by `raidscan`.
- Add the following HORCM environment variables to the root user `.profile` (sh and ksh) or `.login` (csh) file:
 - `HORCC_MRCF` is needed for Business Copy.
 - `HORCMINST` is the instance number in the `/etc/services` file, which is 0 for this example.
- Log off and then log in to the server as root.

Setting up the database and backup servers

The setup of the database and backup servers includes preparing the tape library, and installing and configuring Data Protector. This document assumes that Oracle is already installed, that a database instance is up and running, and that the database data files and control files are located on XP disk array volumes.

Preparing the hardware on the database and backup servers

A shared tape library is part of the XP external storage Oracle ZDB solution.

NOTE:

This document does not present the details of installing a tape library on the SAN. Please refer to the *HP StorageWorks Enterprise Backup Solution Design Guide* at <http://www.hp.com/go/ebs> for detailed information on installing a tape library.

The tape library robot and tape devices should be presented to both the database server and the backup server. Output from `ioscan` should show the robot and tape devices. For example:

```
# ioscan -fnkC tape
Class I      H/W Path                                Driver  S/W State  H/W Type  Description
=====
tape  20      0/9/0/0.1.55.255.0.0.0 stape   CLAIMED   DEVICE   HPULtrium 2-SCSI
        /dev/rmt/20m /dev/rmt/c35t0d0BEST
        /dev/rmt/20mnb /dev/rmt/c35t0d0BESTn
        /dev/rmt/20mb /dev/rmt/c35t0d0BESTb
        /dev/rmt/20mn /dev/rmt/c35t0d0BESTnb
tape  21      0/9/0/0.1.55.255.0.0.1 stape   CLAIMED   DEVICE   HPULtrium 2-SCSI
        /dev/rmt/21m /dev/rmt/c35t0d1BEST
        /dev/rmt/21mnb /dev/rmt/c35t0d1BESTn
        /dev/rmt/21mb /dev/rmt/c35t0d1BESTb
        /dev/rmt/21mn /dev/rmt/c35t0d1BESTnb
tape  22      0/9/0/0.2.55.255.0.0.0 stape   CLAIMED   DEVICE   HPULtrium 2-SCSI
        /dev/rmt/22m /dev/rmt/c54t0d0BEST
        /dev/rmt/22mnb /dev/rmt/c54t0d0BESTn
        /dev/rmt/22mb /dev/rmt/c54t0d0BESTb
        /dev/rmt/22mn /dev/rmt/c54t0d0BESTnb
tape  23      0/9/0/0.2.55.255.0.0.1 stape   CLAIMED   DEVICE   HPULtrium 2-SCSI
        /dev/rmt/23m /dev/rmt/c54t0d1BEST
        /dev/rmt/23mnb /dev/rmt/c54t0d1BESTn
        /dev/rmt/23mb /dev/rmt/c54t0d1BESTb
        /dev/rmt/23mn /dev/rmt/c54t0d1BESTnb

# ioscan -fnkC autoch
Class I      H/W Path                                Driver  S/W State  H/W Type  Description
=====
autoch 2      0/10/0/0.2.39.255.0.0.0 schgr   CLAIMED   DEVICE   HPESL9000 Series
/dev/rac/c20t0d0
```

After the tape library robot and tape devices are presented to both the database server and the backup server, Data Protector can be installed and configured.

Installing Data Protector components

NOTE:

Prior to installing Data Protector components on the application and backup servers, all required Data Protector patches must be installed on the Data Protector installation server. At the release of this document, the following patches are required for HP-UX 11i PA-RISC servers (subsequent Data Protector 5.5 builds or patches may supersede these patches): PHSS_32844 (XP agent patch) and PHSS_32332 (Oracle integration patch).

NOTE:

When installing PHSS_32332 on a HP-UX 11iv2 (11.23) PA-RISC server, the `swinstall` utility option `-x allow_incompatible=true` is required.

The following Data Protector components are required for this solution:

- Data Protector Disk Agent
- Data Protector Media Agent
- Data Protector HP StorageWorks XP Agent
- Data Protector Oracle Integration

Run the Data Protector Manager GUI from the installation server to install the required components and license keys. Refer to the *HP OpenView Storage Data Protector Installation and Licensing Guide* for instructions on installing Data Protector.

After Data Protector has been installed, run the Autoconfigure Devices wizard to properly configure the tape library for use by Data Protector.

Configuring the Data Protector Oracle ZDB Integration

The following list gives an overview of the global tasks for configuring the Data Protector Oracle ZDB integration.

NOTE:

Refer to the *HP OpenView Storage Data Protector ZDB Integration Guide* for details on configuring the integration.

1. Link Oracle 10g with the Data Protector 5.5 database library. See [Linking Oracle 10g with Data Protector 5.5 database library](#).
2. Configure Oracle and root users in Data Protector. See [Configuring Oracle and root users in Data Protector](#).
3. Configure the integration for the Oracle proxy-copy ZDB method. See [Configuring the integration for the Oracle proxy-copy ZDB method](#).
4. Create the Data Protector backup specifications using the Administration GUI `xomni`. See [Creating the Data Protector backup specifications](#).

Linking Oracle 10g with Data Protector 5.5 database library

1. Shut down all Oracle instances.
2. Change to the `<ORACLE_HOME>/lib` directory:

```
cd <ORACLE_HOME>/lib32 (32-bit Oracle), or  
cd <ORACLE_HOME>/lib (64-bit Oracle)
```

3. If the `libobk.sl` file exists in the `<ORACLE_HOME>/lib` directory, execute the following command:

```
mv libobk.sl libobk.sl.orig
```
4. Create a soft link to the Data Protector database library:

```
ln -s /opt/omni/lib/libob2oracle8.sl libobk.sl (32-bit Oracle), or
```

```
ln -s /opt/omni/lib/libob2oracle8_64bit.sl libobk.sl (64-bit Oracle)
```
5. Start all Oracle instances.

Configuring Oracle and root users in Data Protector

To start an Oracle backup session, Data Protector must perform an operating system logon to the system where an Oracle server is running. The operating system user name (typically `oracle`) must be registered in the Oracle database and identified by Oracle through the operating system identification. The operating system `root` user name on the Oracle server also has to be added to either the Data Protector `admin` or `operator` user group for both database and backup servers.

See the *HP OpenView Storage Data Protector ZDB Integration Guide* for specific details on determining the correct users to configure in Data Protector.

To configure users in Data Protector:

1. Start the Data Protector Manager GUI:

```
/opt/omni/bin/xomni
```
2. In Data Protector Manager, use the Add Data Protector Users window to add the appropriate users.

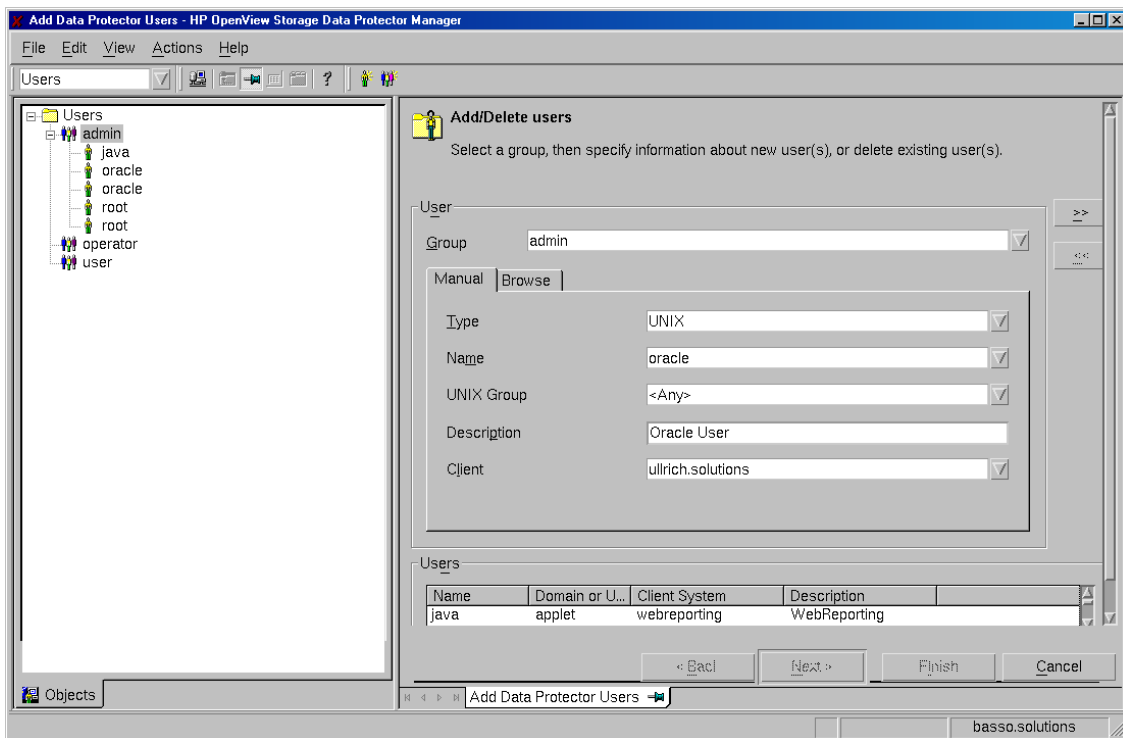


Figure 10 Data Protector Manager – Add Data Protector Users

In [Figure 10](#), the Oracle user on the database server is being added. [Figure 11](#) shows that the Oracle and root users have been added to the `admin` group for both the database and backup servers.

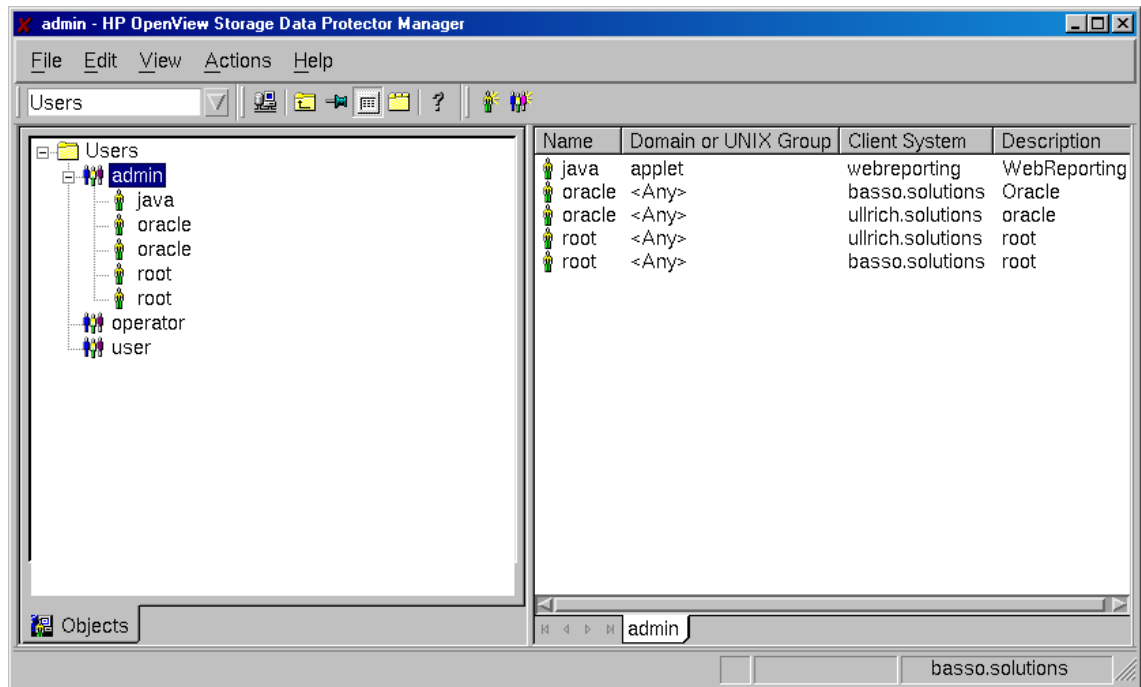


Figure 11 Data Protector Manager – Users

Configuring the integration for the Oracle proxy-copy ZDB method

Before starting the integration, ensure the following:

- A recovery catalog database is recommended for this solution and should be configured and running on the application system. See the Oracle documentation for configuring a recovery catalog database.
- The Oracle network software must be correctly configured and running on the application system. The Oracle network software is needed because during a backup, the Data Protector process, which is running on the backup system, has to be connected to the Oracle Database on the application system through Oracle TNS. Read the detailed instructions in the *HP OpenView Storage Data Protector ZDB Integration Guide* for configuring Oracle TNS.
- For online backup of the Oracle database, the database must be put into *archive* mode.

Oracle client must be installed on the backup system and configured as follows:

1. Ensure that the Oracle software on the backup system and application system have the same directory structure. `ORACLE_HOME` for both Oracle installations must be identical.
2. The database on the application system must be accessible from the backup system. To enable this, verify that the following files are the same on the application system and the backup system. This can be accomplished either by NFS sharing of the files or by manually copying the files from the application system to the backup system. Check that the permissions are identical to the application system.
 - `tnsnames.ora`—The default path is `<ORACLE_HOME>/network/admin/tnsnames.ora`.
 - `init<ORACLE_SID>.ora`—The default path is `<ORACLE_HOME>/dbs/init<ORACLE_SID>.ora`.
 - `orapw<ORACLE_SID>`—This is the Oracle password file. The default path is `<ORACLE_HOME>/dbs/orapw<ORACLE_SID>`.
 - `admin/<ORACLE_SID>`—This is a directory, containing all Oracle configuration files. The default path is `<ORACLE_BASE>/admin/<ORACLE_SID>`.
3. Verify that the Oracle user can log into the Oracle target database as the Oracle database administrator.

4. Verify that the Oracle user can log into the Oracle recovery catalog database as the Oracle recovery catalog owner from the backup system.
5. Verify that the UNIX root user can connect to the target database and the recovery catalog database using the RMAN command on the backup system.
6. Configure the Data Protector Oracle ZDB integration-specific parameters on the backup system using the command line interface:

```
/opt/omni/lbin/util_oracle8.exe -CONFIG_SMB_PROXY <ORACLE_SID>  
<ORACLE_HOME> <TARGET_DATABASE_LOGIN> <RECOVERY_CATALOG_LOGIN>  
<CONTROL_FILE_LOCATION>
```

For example, with the following database information:

- Oracle SID: orcl
- Oracle Home: /oracle
- Database Login: sys/manager
- Recovery catalog database SID: rcvcat
- Recovery catalog login: rman_orcl/rman_orcl
- Control file location: /oracle/oradata/orcl

The util_oracle8.exe utility would be used as follows:

```
/opt/omni/lbin/util_oracle8.exe -CONFIG_SMB_PROXY orcl /oracle \  
sys/manager@orcl rman_orcl/rman_orcl@rcvcat/oracle/oradata/orcl
```

7. Run the following command to check the configuration:

```
/opt/omni/lbin/util_oracle8.exe -CHKCONF_SMB <ORACLE_SID>
```

Creating the Data Protector backup specifications

The next step is to create the Data Protector backup specifications for the Oracle database backup. The following backup specifications should be created for this solution:

- *Oracle database ZDB backup specification*—This is an Oracle server SMB proxy-copy backup specification which controls the flow of the entire database backup process.
- *Oracle archive log backup specification*—This is an Oracle server Archive backup specification which controls the database archive log backup process.
- *Oracle home backup specification*—This is a file system backup specification which controls the Oracle file system backup process. This backup specification should backup all files that are not part of the database and archive log backup specifications that are required for a complete disaster recovery scenario. For example, the database password and parameter files should be part of this backup specification.

Creating the Oracle database ZDB backup specification

1. Start the Data Protector Manager GUI on the cell manager:
`/opt/omni/bin/xomni`
2. Select **Backup** in the navigation window, right-click **Oracle Server** under the Backup Specifications section, and then select **Add Backup**.

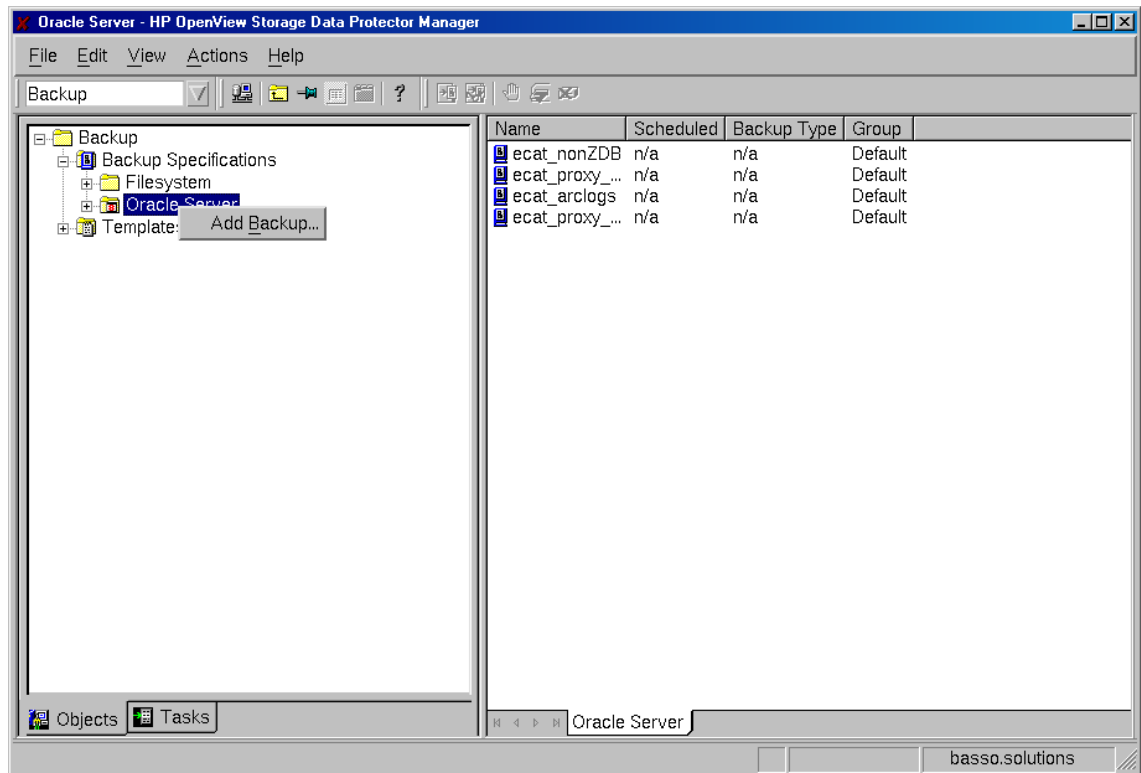


Figure 12 Data Protector Manager – Backup

3. In the Create New Backup window, select **SMB_Proxy_Database** as the Oracle Server backup template. The backup type should be *Split mirror backup*, and the sub type should be *HP StorageWorks XP*.

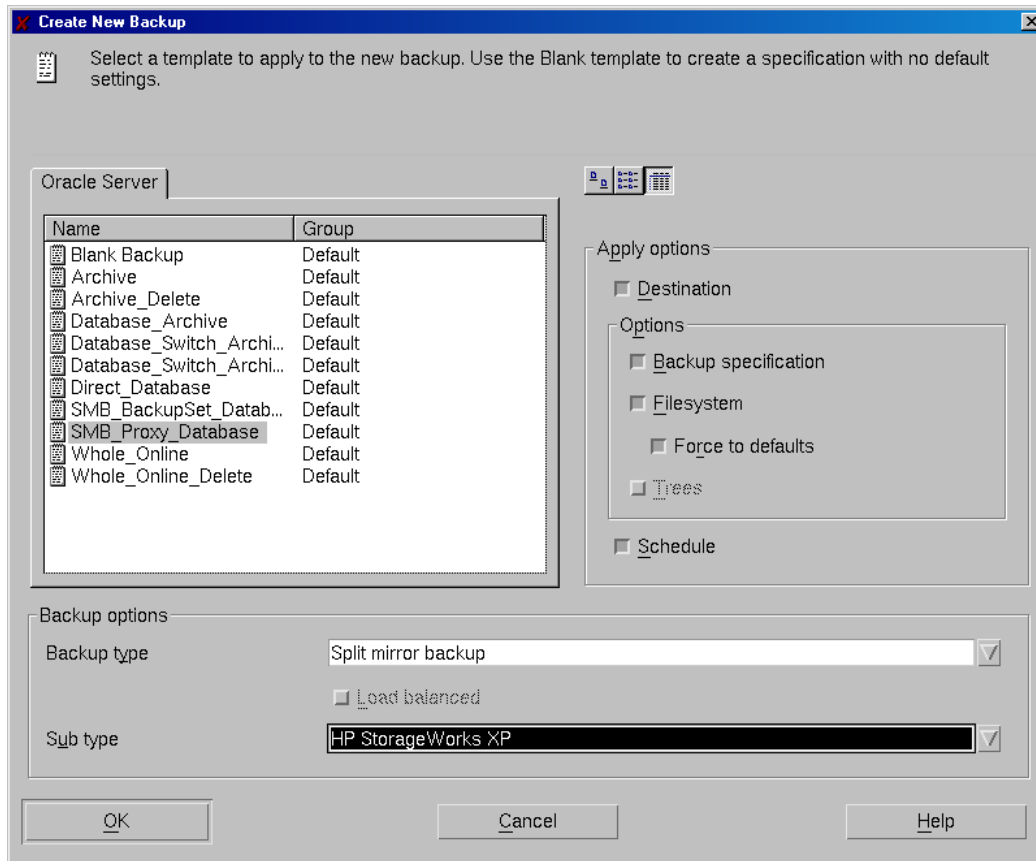


Figure 13 Data Protector Manager – Create new backup

4. Click **OK** to continue.
5. In the next window, enter the Application system and Backup system. The application system is the database server, and the backup system is the server performing the offhost database backup.

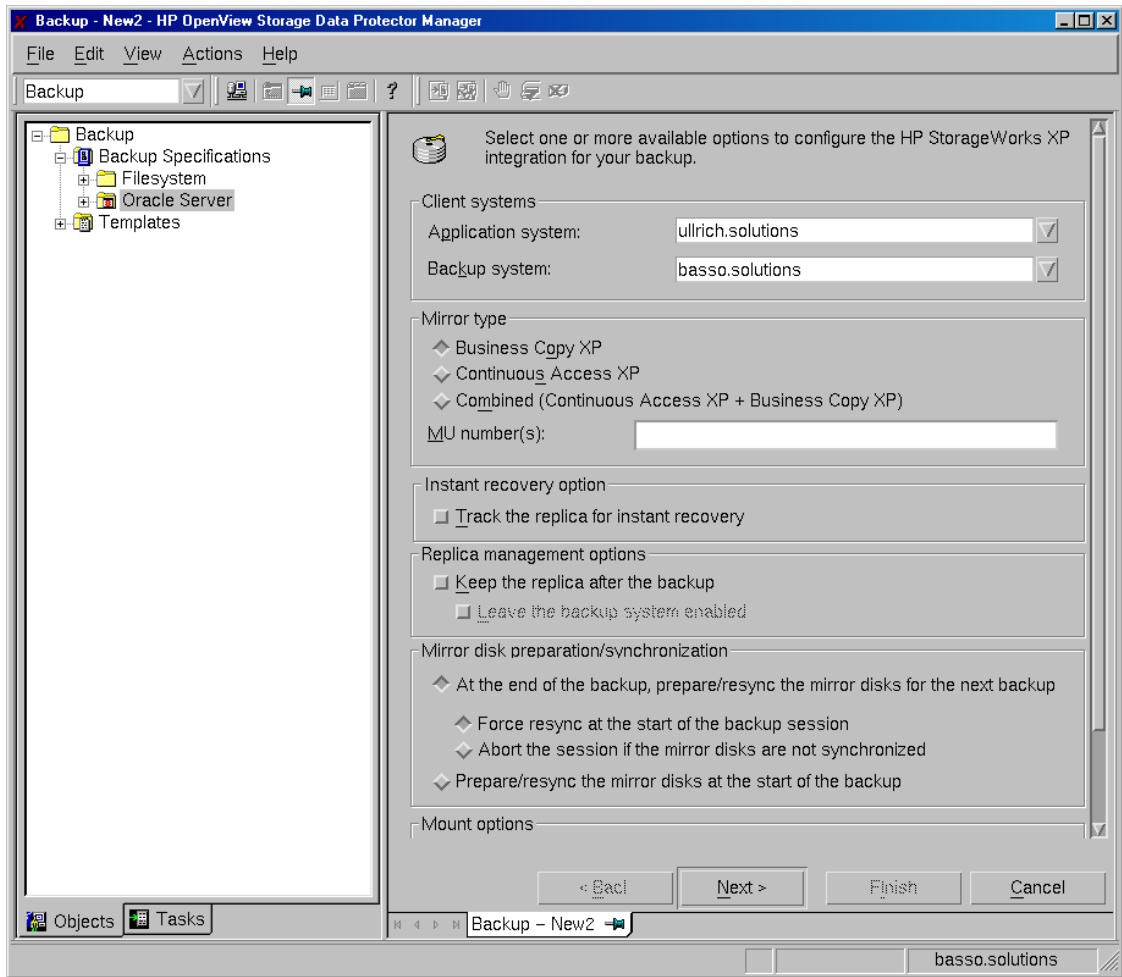


Figure 14 Data Protector Manager – XP integration

6. Click **Next** to continue.
7. In the next window, enter the Application database SID and the user and group names for the user that will log on and perform the backup.

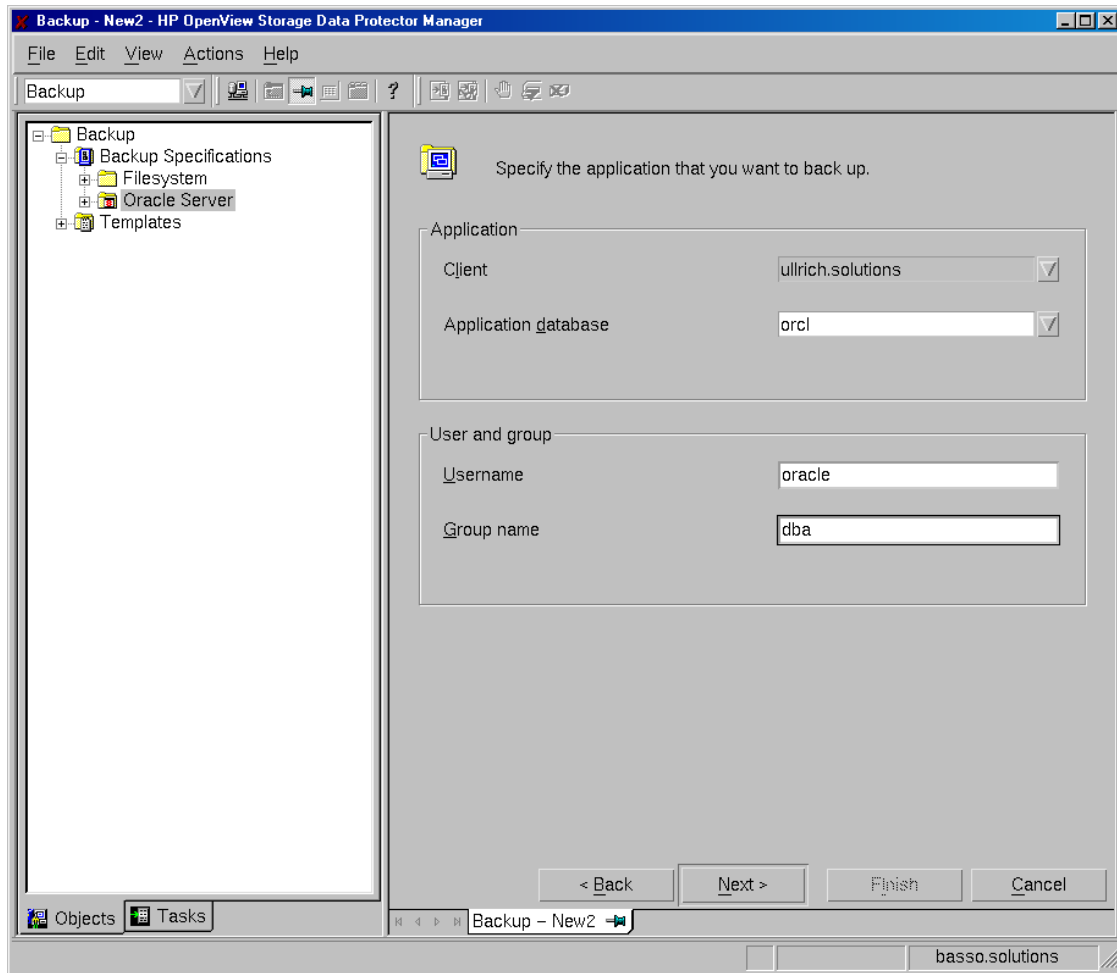


Figure 15 Data Protector Manager – Application to backup

8. Click **Next** to continue.
9. In the next window, select the database and control files to be backed up, and then click **Next** to continue.
10. In the next window, select the devices or drives to be used for the backup, and specify the load balance. The load balance determines how many drives can be active for a single backup session.
11. For each device selected, go to the Device Properties window and set the backup concurrency, media pool, and preferred host. The backup server should be the preferred host for the backup. After setting the properties for a device, click **OK** to close the properties window and save the settings.

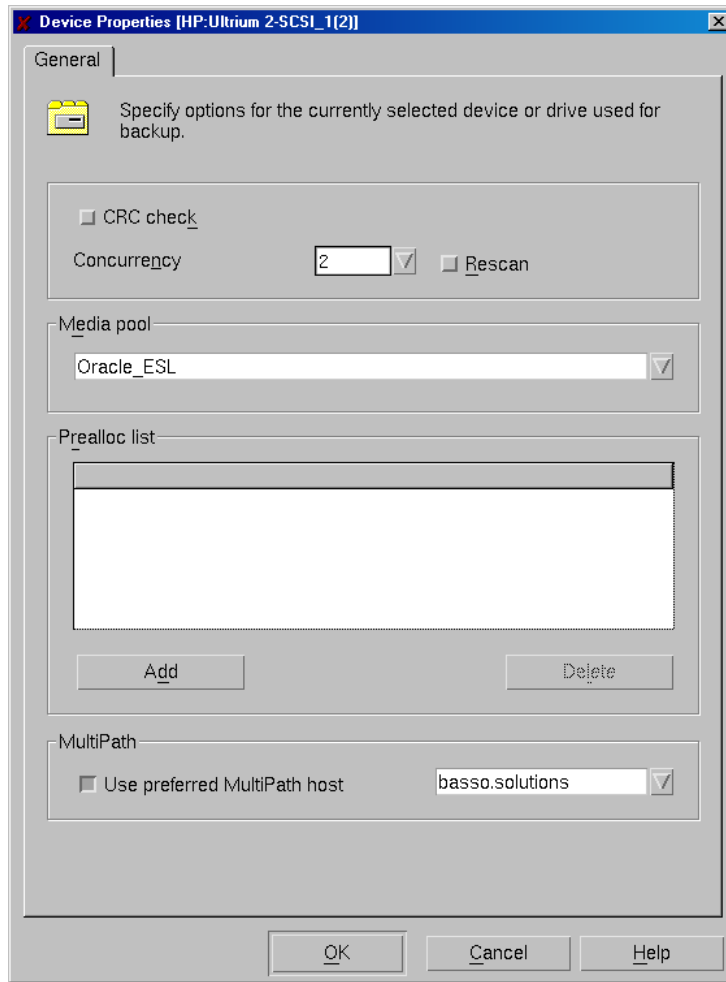


Figure 16 Data Protector Manager – Device properties

12. After the backup device configuration and properties have been completed, click **Next** to continue.
13. In the next window, click **Advanced** in the Common Application Options section and set the desired protection for the backup data. This setting determines how long Data Protector will protect the database backup from being overwritten on the backup media. Click **OK** to close the window.
14. Click **Advanced** in the Application Specific Options section and view the Oracle `RMAN` script that will be used to perform the backup. Offline backup may also be selected in this window if desired. An offline backup will shut down the database prior to backup. Otherwise, the database is placed into backup mode prior to splitting the mirrored volumes, and then put back into normal mode after the split has completed. Click **OK** to save the settings and close the window.

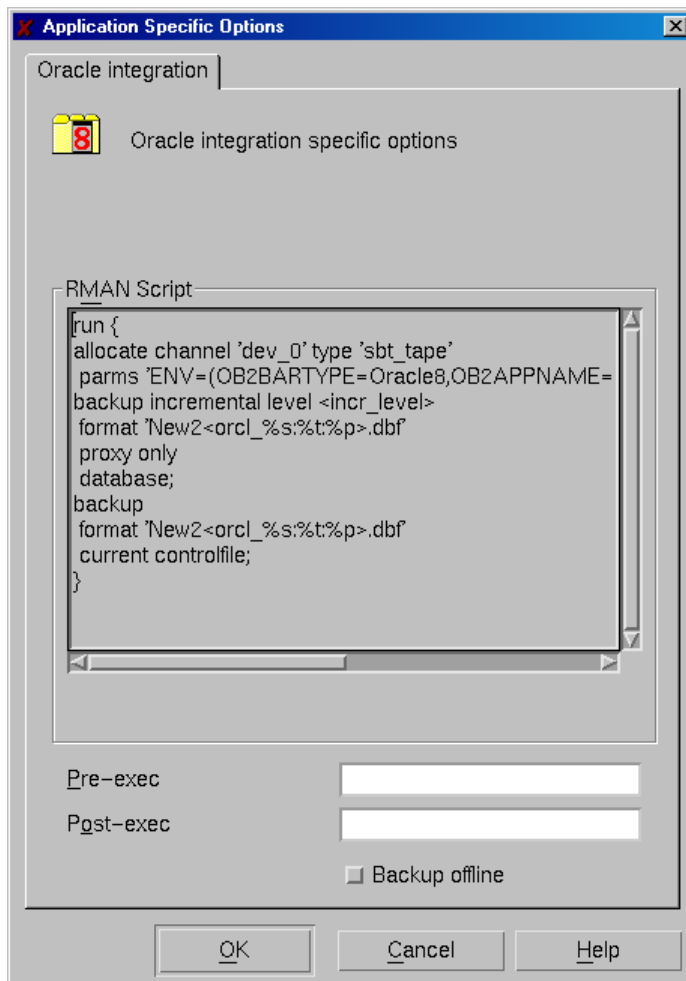


Figure 17 Data Protector Manager – Application specific options

NOTE:

It is important to observe the `OB2DMAP` setting of the `RMAN` script. For a proxy-copy backup, the `OB2DMAP` setting controls the number of concurrent streams to be sent from Oracle to backup devices. The value of `OB2DMAP` should be equal to the number of drives being used for backup, multiplied by the concurrency. For example, if four drives are used for backup and each drive has a concurrency of two, then `OB2DMAP` should be set to eight. The `RMAN` script cannot be edited while creating the backup specification. To edit the `RMAN` script, after saving the backup specification, go to the backup specification properties and click the **Options** tab. From there, click **Advanced** in the Application Specific Options section and edit the `RMAN` script.

15. Click **Next** to continue.
16. In the next window, a schedule can be set to automate when backups are performed. Set the schedule as desired and click **Next** to continue.
17. In the next window, the backup specification should be saved. Enter a meaningful name and save the schedule.

The Oracle database ZDB backup specification is now complete and may be used to backup the database.

Creating the Oracle archive log backup specification



NOTE:

Each Oracle database environment has unique requirements for archive logs and archive log backups. These steps are an example of setting up archive log backups.

1. In the Data Protector Manger Backup window, right click **Oracle Server** under the Backup Specifications section and select **Add Backup**.
2. In the Create New Backup window, select *Archive* as the Oracle Server backup template. Select *Local or network backup* as the backup type.
3. Click **OK** to continue.
4. In the next window, enter the Application system (database server), the Oracle database SID, and database user, and then click **Next** to continue.
5. In the backup source selection window, select **ARCHIVELOGS**, and then click **Next** to continue.
6. In the next window, select the tape devices to be used for backup. The properties of the tape devices can be configured as they were in the Oracle database ZDB backup specification.
7. Click **Next** to continue.
8. In the backup options window, set the desired protection for the backup data as was done in the Oracle database ZDB backup specification, and then click **Next** to continue.
9. In the next window, set the desired backup schedule, and then click **Next** to continue.
10. In the next window, save the backup specification with a meaningful name.

Creating the Oracle home backup specification

The Oracle home backup specification is created the same as any file system backup specification. Create the backup specification as follows:

1. In the Data Protector Manger Backup window, right-click **Filesystem** under the Backup Specifications section and select **Add Backup**.
2. In the Create New Backup window, select *Blank Filesystem Backup* as the backup template. The backup type should be *Local or network backup*.
3. Click **OK** to continue.
4. In the next window, select the desired file system or files for backup. This should include all Oracle files that will be needed for recovery that are not part of the database and archive log backups.
5. Click **Next** to continue.
6. In the next window, select the tape devices to be used for backup. The properties of the tape devices can be configured as they were in the Oracle database ZDB backup specification.
7. Click **Next** to continue.
8. In the backup options window set the desired protection for the backup data as was done in the Oracle database ZDB backup specification, then click **Next** to continue.
9. In the next window, set the desired backup schedule, and then click **Next** to continue.
10. In the next window, save the backup specification with a meaningful name.

Running the Data Protector backup specifications to accomplish a ZDB of the Oracle database

A backup can be initiated manually or through the backup specification schedules. HP recommends testing the backup manually prior to using the automated schedules.

Running the backup manually

To manually activate the database backup, right-click the backup specifications that have already been created and select **Start Backup**.

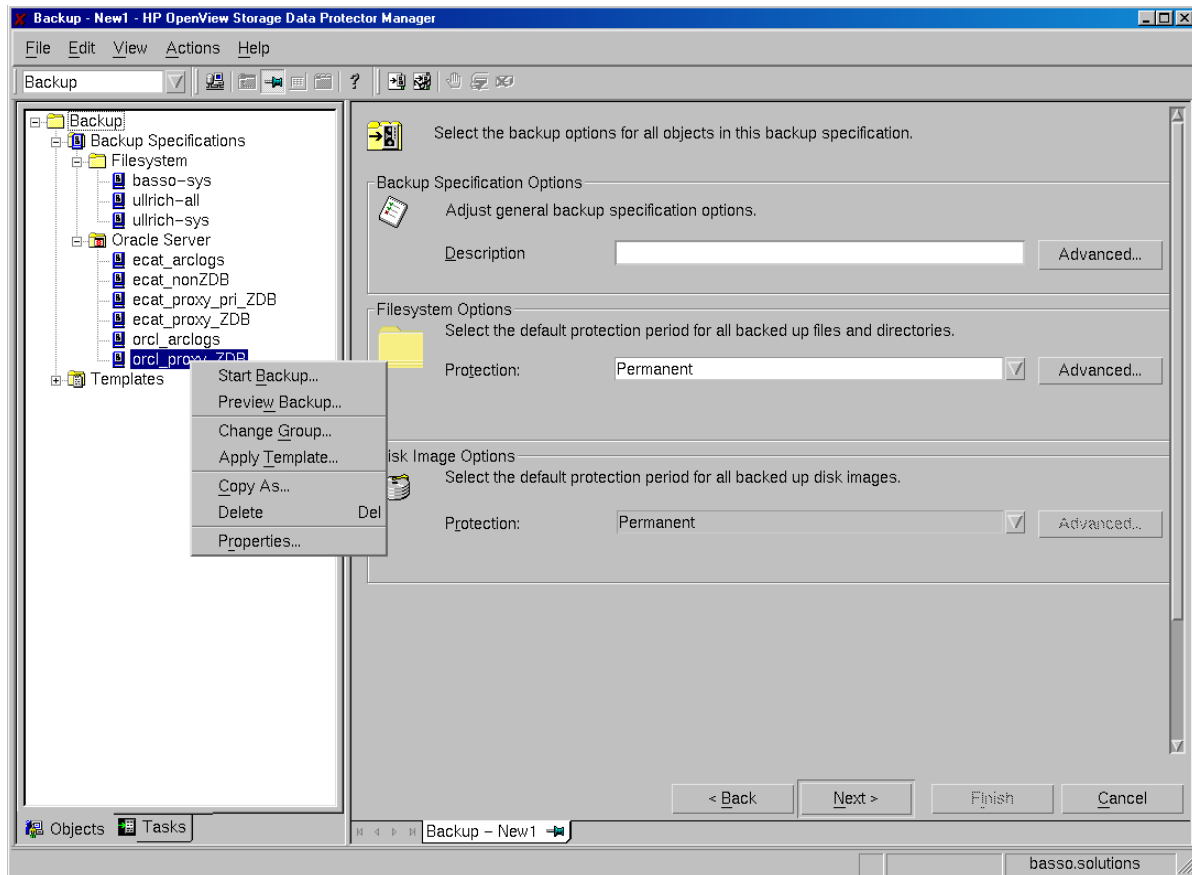


Figure 18 Data Protector Manager – Start backup

The backup specifications can be run simultaneously; however, there may be contention for tape devices, file systems, database, and so forth, so it is recommended to run the backup specifications one at a time.

To follow the backup progress, use the Data Protector Manager GUI. When backups are initiated, the progress is sent to the Backup window. The Monitor window can also be used by selecting the current session associated with the backup.

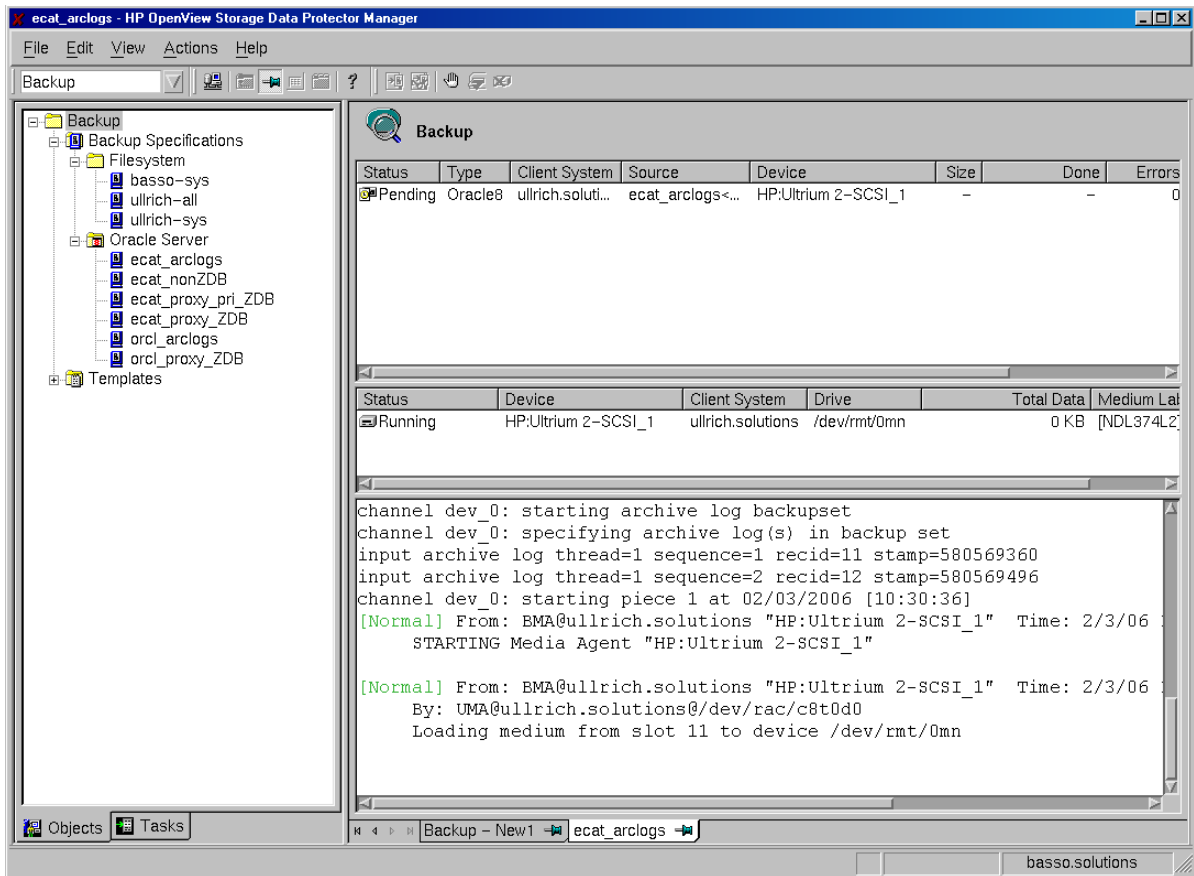


Figure 19 Data Protector Manager – Monitor window

Automating the backup

The Data Protector backup specification schedules should be created when backup specifications are created (see [Creating the Oracle database ZDB backup specification](#)). Using the schedules, backups are set to run at a specific time on a recurring basis, depending on business requirements.

3 Oracle Database Restore and Recovery

The process of recovering the database consists of:

1. *Identifying and preparing resources*—Prior to recovery, know the recovery location. Are the required tape drives and media available for recovery?
2. *Preparing the database for recovery*—The database must be put into the proper mode for recovery. The proper mode depends on the nature of the failure.
3. *Restoring needed files*:
 - a. All data files that belong to the tablespaces being restored
 - b. Any archived redo logs needed to make restored files current
 - c. One copy of the control file, if it was damaged
 - d. The parameter file, if different than the current file
 - e. The `orapwd` file, if it was damaged
4. *Recovering the database and applying redo logs*—This step depends on the nature of the failure and whether the database needs to be online during recovery. Oracle provides methods for performing data file recovery, tablespace recovery, and database recovery. Consult the Oracle documentation for more information on these functions.

See the *HP OpenView Storage Data Protector ZDB Integration Guide* for detailed instructions on restoring the database data files, control file and archive logs from a backup.

Glossary

backup server	The offhost that does data backups from the BC volumes to tape.
Business Continuance (BC) volume	An XP internal or external storage copy of logical volumes on the XP disk array.
command device	A volume on the XP disk array that accepts Business Copy control operations which are then executed by the disk array.
database/application server	The Oracle database server.
join	The process of placing a XP disk array P-Vol and S-Vol into a paired state. This causes the S-Vol to resynchronize with the P-Vol.
LDEV	A simulated disk that is created from physical disks in an XP disk array for use by a host.
paircreate	The process of creating a mirrored pair between two LDEVs on an XP disk array.
P-Vol	The primary or main volume that contains data to be copied.
S-Vol	The secondary or remote volume (a BC volume that mirrors data on a P-Vol).
split	The process of breaking the paired state of a P-Vol and an S-Vol on an XP disk array for the purpose of mounting the S-Vol on an offhost for a task such as backup.
synchronize	The process of ensuring that an XP disk array S-Vol is synchronized with the P-Vol.

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